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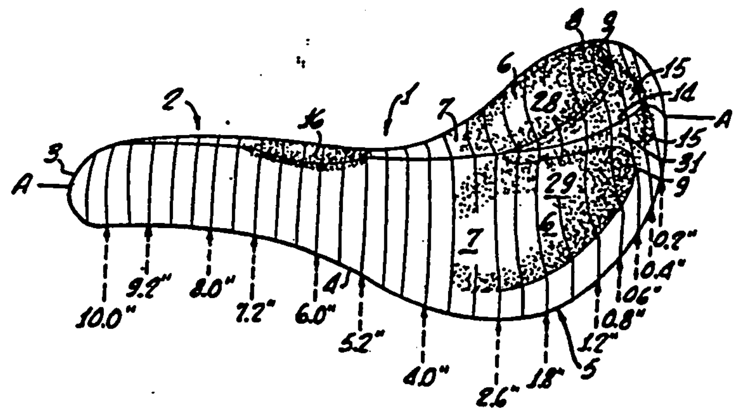

(57) Abstract

An anatomically conforming cycle saddle (1) having a compound surface including an elongated horn section transitioi ing rearwardly into a laterally flared, raised cantle. A perineum/genital relief (16) is symmetrically disposed along the longitud nal axis of the generally horizontal upper horn surface as seen in plane view. The cantle (5), having an angle of inclination great than 35 degrees, preferably 45 degrees, includes a pair of opposed, bilaterally symmetrical, inclined dished surfaces (6), and has generally triangular, bilaterally symmetrical, raised, inclined coccyx support member (14) disposed centrally and rearward therebetween. The concavity of the dished surfaces begins in the forward-most horizontal part of the cantle (5) and extends de

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ORTHOTIC CYCLE SADDLE

FIELD:

This invention relates to new and improved saddles for cycles, the contours of which (particularly the horn and cantle) are specially adapted to conformingly support the sacral, coccal, ischial and perineal/genital regions of the rider in order to improve rider comfort and permit improvements in a cyclist's pedaling efficiency and power output while remaining seated. More particularly, the invention relates to a new anatomic bicycle seat design that incorporates various unique anatomically conforming and fully supporting portions in the aft (cantle) and forward (horn) portions of the saddle shell.

BACKGROUND:

The basic design of a bicycle saddle, much like the basic design of the bicycle, has not changed significantly in over 100 years. The shape of modern, performance-oriented bicycle saddles is generally horizontal in profile with a narrow front end portion (the horn or pommel) and a wider, flared tail portion with a concave intermediate portion for thigh clearance.

The materials of construction of early saddles were generally limited to solid or perforated wood, cane, or like rigid materials. The design of later saddles included cushion covers incorporated with a wood or metal framework. Some modern saddles still employ materials that were common in the early history of cycling, such as the semi-rigid, all-leather, shell-type saddle, but the majority of today's saddles

take advantage of the great advances in materials technology.

Most modern high performance saddles consist of a pliable or semi-rigid molded plastic or nylon shell over which conforming padding material is placed, and finally a leather, plastic or vinyl cover is fitted. The use of these materials in modern saddles has resulted in a lighter, more durable and more appealing saddle than those of even ten years ago, but the seat contours remain substantially the same.

One of the major design considerations of cycle saddles is comfort. One approach to providing comfort for the cyclist is by conforming the saddle to the cyclist's posterior. U.S. Pat. Des. No. 25, 030 (**Young**, 1895) discloses a conventional horizontal saddle design wherein conformation is achieved by the removal of material. Concavities are preformed into the horizontal saddle surface corresponding to the pelvic bone and perineum regions of the cyclist. Concave regions along the sides of the saddle are further disclosed to assist in the freedom of movement of the cyclist's inner thighs when pedaling. U.S. Pat. No. 1,858,477 (**Blake**, 1932) teaches having a channel-shaped cavity suitably located in the saddle to normally receive and partly contain the privates of a male rider and partly receive the privates of a female rider.

In both these U.S. Patent Nos. 25,030 and 1,858,477, support for the sacrum, coccyx and other rear pelvic projections was not considered. Areas of contact are the ischial tuberosities (bottom part of

the pelvic bone), and the genital and perineal regions. The genital channels were required to be deep in order to reduce the downward pressure exerted on this area by the rider's weight. However, such exaggerated grooves or channels become excruciatingly uncomfortable, especially during vigorous pedaling, since they require the rider to carefully align his or her privates with the genital groove. This becomes increasingly difficult when the rider must repetitively "get out of" the saddle in order to stretch his or her legs or to move his or her position frequently to use different muscles to accommodate continuously changing terrain.

Another way to conform a saddle is to add a cushioning material to the saddle surface. U.S. Pat. No. 576,310 (**Henderson**, 1897) discloses a bicycle cushion design wherein a cloth cover or like material is selectively stuffed with a flexible and resisting material to form soft cushion lobes. The cover is then stretched over a wood or similarly rigid horizontal saddle base resulting in a cushioned saddle with strategically placed ridges said to support the pelvic bones of the cyclist. In U.S. Pat. No. 3,844,611 (**Young**, 1974), two layers of high low-density resilient foam padding material are placed on a horizontal saddle base having two horizontally and rearwardly disposed concavities and a forwardly disposed concavity suitably placed for the seated rider's privates. These concavities are "hollowed" down into a horizontal saddle base below the said "shelf" portion in such a manner as to support the ischial tuberosities of the pelvis while leaving the rear ischium, coccyx and sacrum unsupported. The pressure on the

ischial tuberosities and the genitals is said to be greatly diminished by the shock-absorbing qualities of the padding.

For a long time the best saddles employed a fine grade semi-rigid leather material as a saddle base. Indeed, many still argue that a leather saddle, once broken in, is the height of comfort. This idea began to change when pliable nylon-based shells were introduced. Pliable shells, as the name implies, generally comprise a pliable plastic base, onto which molded foam is added and then covered with a vinyl, leather, or plastic covering. In the mid-70's, the so-called "anatomic" saddle became popular. These anatomic saddles combine a more subtly designed pliable nylon base shell upon which padding materials are placed. Early anatomic saddle designs were unduly flexible thereby causing fatigue and discomfort to the rider. U.S. Pat. No. 4,098,537 (Jacobs, 1978) discloses an improved bicycle saddle incorporating a longitudinal tension rib for increasing the longitudinal stiffness of the saddle and a transverse rib extending across the saddle at the central transition portion to impart flexural stiffness to the saddle.

Despite the improvements made to enhance the comfort and stiffness of the anatomic saddle, the support of the pelvic region in these saddles was still incomplete. Only the bone structure in the immediate area of the ischial tuberosities is anatomically supported leaving the coccyx, sacrum and the steeply rising rear ischial regions (including associated tissues and musculature) unsupported.

The recent trend in saddle design is to find the right amount of padding necessary to provide adequate comfort to the rider while still conforming to the saddle shell. Too little padding conforms to the semi-anatomic shape of the saddle nicely, but padding (especially foam) gives out at the point of most pressure and therefore bottoms out at the most painful areas directly beneath the pelvic bones. To address the point pressure problem inherent with foam padded saddles, manufacturers have introduced visco-elastic polymer (VEP) padding to replace the foam padding on today's state-of-the-art saddles. The VEP saddles employ a gel-like polymer to displace point loads under the ischial tuberosities. This VEP type padding creates a "water bed" type of pressure displacement by immersing the buttocks area in a semi-liquid type padding. This "water bed" type of pressure displacement may spread out the point load pressure upon the ischial tuberosities, but because it is a moveable fluid it still cannot firmly grip the pelvis; thus undue movement of the pelvis occurs during a pedaling motion. Hence, there is a loss of energy transmitted to the pedals when the pelvis is left unsupported or not firmly supported, and stability is decreased through undue movement of the buttocks on the saddle surface.

Thus, the problem with today's more heavily padded, semi-anatomic saddles is that discomfort is caused to the cyclist from excessive pelvic float or movement on the seat surface. This excessive movement or grinding of the pelvic areas can cause bruising, groin pain, numbness, urethritis, neuritis, saddle sores and chafing. These ailments are aggravated by

friction and any undue pressure that is caused to be exerted on the blood vessels and nerves along the inner and underside of the rider's pelvic region. This is to be contrasted with the present invention which requires no break-in period to obtain full, initial anatomic conformity. In accordance with the present invention, point loads are fully displaced and excessive friction causing movement upon the saddle is eliminated.

It is known in the art that power transmission can be enhanced by constraining the movement of the rider's pelvis on the saddle. U.S. Pat. No. 638,861 (**Bean**, 1899) discloses a bicycle harness designed to provide an abutment for a point of resistance more or less directly above the pedals, which enables a rider to greatly augment the power of his downward thrust upon the pedals. More recently, a device called the "tether," a wire sling leading from the handle bar rearward around the waist of the cyclist has been used by professional racing cyclists. In addition to providing a point of resistance for allowing the rider to maximize his thrust potential against the pedals while seated, valuable energy is conserved since the rider is relieved of using his or her own arm muscles to provide this resistance. The tether also encourages a round spin whereby full use of the quadriceps muscles imparts a driving force on the pedals at substantially every degree of crank arm rotation. Furthermore, the tether encourages the cyclist to assume a relatively more aerodynamic posture, reducing the frontal area of the rider/machine combination. A reduction in frontal area means less wind resistance

to the cyclist, permitting him or her to sustain a higher average speed for a longer period of time.

However, the tether is not without its serious disadvantages. The tether can be dangerous when riding in crowded situations where mishaps are likely to occur, as is likely in an organized recreational ride, training ride, or race. Tethers are dangerous because they have no quick release mechanism to prevent a rider from becoming entangled with his or her bike during a crash. Consequently, the use of a tether has been banned in all types of mass-start racing in the United States and all other countries subject to UCI (Union Cyclist International) rules, which include any country that sanctions amateur or professional bicycle racing. In comparison, my new SCI shell design provides the increased aerodynamic and thrust advantages of tethers without the dangers through full anatomic conformity to the rear pelvis and buttock regions.

The prior art is replete with cycle saddles having raised cantles or back rests acting as either thrust plates or back supports for the rider. U.S. Pat. No. 4,141,587 (**Holcomb**, 1979) and U.S. Pat. No. 4,502,727 (**Holcomb**, et al., 1985) disclose saddles having a flat base with a rearwardly disposed back rest curving upwardly approximately 90° from the base. The major function of the back rest in these references is to provide comfort for casual riding. Neither saddle is particularly contoured to support the rider's pelvis other than cutouts for leg clearance and the back rest. Comfort is achieved by supplying a generous layer of sponge padding material

to the flat surface and back rest. U.S. Pat. No. D-293,394 (**Holcomb**, 1987) discloses a flat saddle having cutouts for leg clearance and a rearwardly disposed right-angled cantle. As seen from an end view, the cantle is semi-circular and extends upward a distance equal to approximately 1/3 the saddle's longitudinal dimension. As in the two immediately preceding references, comfort is achieved by a generous layer of sponge-like foam padding material of substantially uniform thickness. Other examples of cycle saddles having rearwardly disposed, curved upward cantles or backrests include U.S. Pat. No. 615,077 (**Lovekin**, 1898); U.S. Pat. No. D-287-317 (**Allen et al.**, 1986); U.S. Pat. No. D-29-719 (**Leech**, 1898); and U.S. Pat. No. D-27,956 (**Serson**, 1897). The cantle portions of these saddles are highly exaggerated and curve upward from the horizontal saddle base anywhere from 45° to 90°. **Leech** and **Serson** further disclose totally relieved portions in the saddle for the private parts of the rider.

U.S. Pat. No. 556,250 (**Brown**, 1896) discloses a cycle saddle having a totally relieved central area and a raised cantle. The cantle is shallow and therefore provides little or no thrust capability. Thus, in each of the previously mentioned patents containing a raised cantle or backrest, there is no specific, bilateral anatomic support of the steeply rising rear pelvic areas, namely the rise to near vertical of the bone structure of the right and left rear ischial bones combined with their corresponding musculature and tissue as is provided by the present invention. Prior art raised cantle saddle designs do not contain a wedge-like coccyx support located in the

upper cantle regions. It must be noted herein, that when reference is made to the term "coccyx support" or "coccyx tongue" in this application, these terms not only refer to the relief and support of the coccyx but also refer to the anatomic benefits derived from the placement of a support projection (containing wedge-like, rearwardly flaring side surfaces) in the upper medial area of the raised cantle of the present invention. In accordance with the present invention, the flared lateral surfaces of this wedge-like projection correspondingly fit between the rider's buttocks (directly below and forward of the coccyx) to provide a unique anatomic barrier to the rearward movement of the buttocks on the saddle when pedaling, thereby providing additional surface area for the comfortable displacement of the rider's weight on the saddle by uniquely supporting areas of the buttocks not considered by previous saddle designs.

U.S. Pat. No. 1,462,976 (Mesinger, 1923) and U.S. Pat. No. 3,269,773 (O'Connor, 1966) disclose saddles having backrests for use on motorcycles. In Mesinger, the backrest is detachable, whereas in O'Connor, the backrest is sufficiently low enough to permit a second passenger seat to be fitted in tandem with the first, forward drive seat. Both motorcycle seats employ the backrest as a means for overcoming the inertia of the riders in the starting and acceleration of the motorcycle. U.S. Pat. No. 2,568,796 (Dunlap, 1951) and U.S. Pat. No. 4,462,634 (Hanagan, 1984) also disclose motorcycle saddles with slightly raised cantles. However, as was previously mentioned, the saddles intended for motor sport use are concerned primarily with the inertia of the rider and passenger

due to acceleration; thus, saddle comfort on these saddles is due to generous padding with little or no regard for close and firm sacral, coccal, or ischial support.

U.S. Pat. No. 574,503 (**Van Meter**, 1897) discloses a cycle saddle having two rearwardly disposed, bilaterally symmetrical concavities for receiving the tuberischia, a centrally disposed groove for the perineum region, and a raised cantle. The rearward concavities are also padded by means of air sacs disposed between the metal frame of the saddle and the saddle cover. The perineum groove is overly deep and long, extending needlessly far into the cantle to provide any support. The raised cantle merely slopes gently upward and lacks any concavities or special wedge-like projections to provide close anatomic support for rearwardly disposed bones of the pelvis or for the unique support of the area between the buttocks located directly below and forward of the coccyx. The shallow inclination also tends to permit the rider to slide off the back of the saddle rather than provide a thrust plate for the rider.

It must be noted that the rearwardly disposed concavities of U.S. Pat. No. 574,503 lie only in the horizontal plane of the horn surface and are designed solely for the ischial tuberosities to sit "upon". This is contrasted to the present invention in which the steeply rising rear ischium and its projections slide rearwardly "into" a pair of raised, bilateral concavities. The rise in the surfaces of these concavities correspondingly matches the rise to near

vertical of the right and left rear ischium when seated.

In studying prior art saddle configurations containing raised cantles, it is important to recognize that these designs ignore the more subtle differences in the anatomic detail of the rear pelvis. These prior-art, raised cantle, saddle designs cannot closely follow the rise to near vertical of the right and left rear ischium, since (as seen in the study of rear pelvic anatomy) to do so would mean that the cantle (of prior art designs) would rise directly into the coccyx. Therefore, unless the cantle's anatomic support of the near vertical portions of the rear ischium and its projections is combined with the relief and support of the coccyx (as contained in the present invention), an uncomfortable condition will occur in which the coccyx interferes with the said near vertical rise of the cantle's rear ischial support. Thus, the prior art, semi-anatomic designs have avoided this by reducing the rate of incline of their cantle surfaces in the area of the rear ischium, so that the coccyx is not particularly supported and support of the near vertical rise of the rear ischium cannot be achieved. By placing a medially located, wedge-like coccyx support area in the upper, aft end of the SCI's raised cantle, the near vertical support of the corresponding rear ischium can be achieved while displacing more of the rider's weight over an increased surface area of the pelvis and buttocks.

Additionally, as will be noted later in the detailed description, the uppermost regions of the rearwardly disposed concavities of the present inven-

tion can be extended upwardly to support even more of the right and left rear ischium, while leaving the coccyx support at the same height as disclosed in the preferred embodiment. Thus, the rear uppermost portions of the concavities would rise in relation to the coccyx support area (which separately conforms to the coccyx and the area between the buttocks located directly below and forward of the coccyx of the pelvis). The rise in height of these concavities would be determined by the amount of thrust improvement desired combined with aesthetic considerations.

Another problem with current saddle design is that the lack of close rearward pelvic support combined with the wedge-like features of the coccyx support causes the top of the pelvis (or crests of the ilium) to rotate rearwardly while the ischial tuberosities stay in a relatively stationary position on the seat. Thus, when riding for long periods of time with the lower spine assuming an arched or hunched forward position, lower back pain is experienced. This constant bending of the lower vertebrae causes stress on the muscles and nerves of the lower back.

Accordingly, there is a need in the art for an improved cycle saddle that is specially contoured to semi-rigidly and fully support the coccyx (and thus the adjacent sacrum) and the steeply rising rear ischium, while providing a relieved area for the perineum/genital regions. This includes the support of the corresponding tissues and musculature surrounding these aforementioned pelvic areas (including the area between the buttocks located directly below and forward of the coccyx). There is also need for a

saddle that conformingly fits a rider's pelvis and buttocks like a glove so that:

a. point loads between the bony projections of the rider's pelvic region and the saddle are evenly distributed;
b. lower back pain and muscle tension are reduced;
c. common ailments related to excessive pelvic float are substantially eliminated;
d. saddle sores, chafing, numbness, neuritis, bruising and the like are reduced or eliminated; and
e. power thrust to the pedals is enhanced while maintaining a more aerodynamic and energy-conserving riding position.

Accordingly, it is an object of this invention to provide a lightweight orthotic cycle saddle having improved performance, support and comfort characteristics.

It is another object of this invention to provide a cycle saddle specially contoured to support up to 50% more of the bone, muscle and tissue structure of the pelvis and buttocks over conventional saddle designs.

It is another object of this invention to provide an improved cycle saddle specially contoured to unweight sensitive genital areas of both male and female cyclists.

It is another object of this invention to provide an improved cycle saddle specially contoured to distribute the rider's weight evenly over a larger surface of the saddle thereby eliminating point loads between the rider's pelvic bones and the hard contact area of the saddle.

It is another object of this invention to provide a raised wedge-like coccyx support projection having downwardly sloping and rearwardly flaring lateral surfaces, creating a wedge-like barrier in the aft, upper portion of the saddle's raised cantle, thereby preventing unwanted rearward movement of the buttocks while pedaling.

It is another object of the invention to provide an improved cycle saddle specially contoured to redistribute pressure which is normally on the anterior portions of the ischial tuberosities and upon anterior portions of the pelvis and pelvic arch in conventional saddles, to the steeply rising posterior sections of the pelvis including the rear ischium, sciatic notch area, ischial spines, coccyx and sacrum.

It is another object to provide a cycle saddle with an inclined, anatomic, bilaterally flared cantle containing a pair of rearwardly disposed, inclined (rising to nearly vertical) concavities that form a power-improving thrust plate into which the corresponding bones of the rear ischium (which also rise to a near vertical attitude) slide rearwardly into.

Still other objects of the invention will be evident from the specification and drawing, including the detailed description.

SUMMARY OF THE INVENTION

A new, more completely and anatomically conforming bicycle seat provides various unique anatomic conforming features fully supporting the sacrum, coccyx and complete ischium (SCI) of the rider and generally includes a shell having a single, compound upper seating surface, said seating surface including a forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of bilateral concavities matching the near vertical portion of the right and left ischium of a rider when seated upon said shell, for proving bilateral anatomic support for the near vertical portion of the right and left ischium including corresponding musculature and tissue and means for securing said shell to a cycle saddle post. Accordingly, a saddle in accordance with the present invention is referred to as an SCI-type saddle.

More particularly, the concavities in accordance with the present invention commence at forward margins in the cantle where the ischial tuberosities of the pelvis contact the saddle shell surface, and then rearwardly and upwardly incline rapidly until the incline approaches a vertical attitude in relation to the normal, generally horizontal plane of the seat. This rise of the rearwardly disposed concavities to an

approximately vertical attitude corresponds to the upwardly sloping rise of the rear ischium to a near vertical attitude when the rider maintains a seated position. The outer margins of the concavity portions flare outwardly and rearwardly to the widest point of the cantle, and then taper back inwardly toward a medial line of the seat. Also the incline concavities, which begin in the frontal cantle area, increase in depth toward the middle of the raised cantle and then decrease in concavity and taper again at the aftermost portion of the seat to form a ridge. As previously mentioned, when the rise to near vertical of the right and left rear ischium is closely supported (as is the case with the raised, rear cantle of the present invention), a centrally located coccyx support is necessary to relieve and support the coccyx (including the support of the area between the buttocks located directly below and forward of the coccyx), so that the cantle does not rise directly into and uncomfortably intersect the coccyx. This raised, wedge-like adaptation for the anatomy in the area of the coccyx bilaterally separates the raised cantle of the present invention and allows the rearwardly disposed areas of the pelvis and buttocks to be more closely gripped than prior art saddles. As has been noted previously and also in the detailed descriptions, the rear uppermost regions of the SCI saddle rearwardly disposed concavities may be extended upwardly and thus farther above the coccyx support than described in the preferred embodiment. This would allow for the support of even more of the near vertical rise of the right and left rear ischium for even greater thrust support.

These outlined margins and the depth of these concavities can vary within the scope of this invention depending upon the use, performance, and comfort requirements of particular bicycle types. For example, an embodiment having greater flare at the previously mentioned points may be used on a mountain bike, woman's bike, or "beach cruiser"-type bicycle, whereas a solely racing version would tend to have less lateral flare.

Therefore, in addition to the anatomically conforming concavities, a sacral-coccyx, wedge-like support area is provided lying medially of, and in an elevated, adjacent position to the upper half of the concavities. A perineal/genital pressure-relief groove is provided along the center line of the saddle in the portion of the horn forward of where it merges with the cantle to provide pressure relief to the private parts of both male and female cyclists.

The SCI-type saddle of the present invention comprises a unique combination of compound, continuous contiguous surfaces (concavities and built-up areas) that provide full anatomical support and accommodation for areas of the pelvis (including the surrounding tissues and musculature) not heretofore supported by prior art seat designs; namely, the complete bone structure forming the pubic arch, the sacrum, coccyx, complete ischium from the ischial tuberosities rearward to the near vertical portions of the rear ischium.

The SCI saddle of this invention is able to support up to 50% more of the bone structure of the

pelvis, as compared to currently available conventional horizontal saddle designs, and simultaneously remove pressure on sensitive perineal/genital areas of the male and female cyclist. This pressure reduction is also termed "unweighting". The SCI saddle also anatomically contacts up to 50% more of the muscle and tissue portions of the buttocks which surround these pelvic areas, depending on riding position. Whether riding in the flexed-forward standard "aerodynamic" cycling position (in which the back is inclined forwardly), or in an upright position, a superior distributive support of rider weight is achieved, reducing chafing, saddle sores and the like.

The SCI saddle of this invention does not rely on the very flexible nature of today's plastic (nylon) saddle, or the "forming" properties of a leather shell to conform to the ischial areas of the pelvis. Instead the SCI's inclined rear bilateral scooped-out portions (herein also termed "concavities" or "scoop surfaces"), and the raised coccyx support "tongue" positioned therebetween along the saddle midline, including the inclined rearwardly flaring wedge-like lateral surfaces of the coccyx support (both in the raised cantle), provide much greater and more even weight support employing a shape in which pressure upon anterior portions of the pelvis (the pubic arch) and pressure on anterior portions of the ischial tuberosities are anatomically redistributed rearwardly to posterior sections of the pelvis and buttocks, including the rear ischium, coccyx, and sacrum. The highly elevated, inclined cantle (having concavities that terminate nearly vertical) of the SCI saddle rises far above the normal horizontal surface plane of

today's saddles to provide close anatomic support to heretofore unsupported rear sections of the pelvis so that a whole new dimension in load distribution is created. Therefore pressure upon the perineum/genital region is greatly diminished by the transfer of weight to the rear concavities and all the surfaces of the raised coccyx tongue in the cantle plate. As previously mentioned, when reference is made herein to the "coccyx support" or "coccyx tongue," these terms not only refer to the relief and support of the coccyx, but also refer to a wedge-like projection which uniquely fits and supports the rider's anatomy between the rider's buttocks (located directly below and forward of the coccyx), so that a unique comfortable support of the pelvis and buttocks is created which in turn provides a wedge-like barrier to rearward movement of the buttocks on the saddle when pedaling.

The preferred material for the SCI saddle is a semi-rigid grade of nylon, formed as a shell by conventional techniques. While other materials can be used for the construction of the SCI shell (such as fiberglass, other types of plastic, or metal), nylon is the presently preferred material for durability and control of flexural properties. The slightly flexible properties of a nylon-type shell allow the SCI configuration to completely grip and support more areas of the pelvis and buttocks than ever before. This grip effect, combined with an almost vertical portion of the cantle concavities and wedge-like surfaces of the coccyx support, provide a solid barrier to prevent the rear ischium from moving rearward, thus allowing the rider to remain seated in a more aerodynamic and

energy-conserving posture for longer periods of time, while permitting the rider to sustain higher average speeds.

Through the use of the SCI's more completely and anatomically conforming shape, the need for excessive amounts of padding (which also adds excess weight to the saddle) to disperse point loads is eliminated. Without the use of excess padding, the SCI shell shape attains superior comfort and distribution of point loads while eliminating undue movement of the pelvis on the seat surface. Thus, frictional movement or grinding of pelvic areas which creates chafing, urethritis, saddle sores and numbness is eliminated while stability and energy transmitted to the pedals is increased. Therefore, the new SCI shell shape requires no initial break-in period through full, initial anatomic conformity while at the same time, there is comparatively little or no padding to break down or wear out.

The raised concavities and wedge coccyx support projection of the SCI saddle provide a push-plate (thrust surface), which permits the rider to exert more force on the cranks while remaining seated and at the same time relieves the forward pull tension necessary to resist the rearward slide of the pelvis experienced with conventional saddles. At the same time, as previously mentioned, these same SCI features prevent the over-rotation of the pelvis and vertebrae of the lower back, thereby reducing back pain.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated in the drawings in which horizontal contour lines help show the compound surface configurations.

Fig. 1 is an elevated side perspective view of the specially contoured saddle of this invention with vertical contour lines showing the general relationship of the saddle's unique features along the longitudinal axis of the saddle;

Fig. 2 is a three-quarter front right perspective view of the saddle of this invention showing the elevation contours of the saddle;

Fig. 3 is a side elevation of the saddle of this invention with elevation contours;

Fig. 4 is a plan view of the saddle of this invention with horizontal contour lines;

Fig. 5 is a perspective view of the saddle showing a rider's pelvis positioned thereon in a first, forward riding position;

Fig. 6 is the identical perspective view of Fig. 5 wherein the rider's pelvis has moved further back along the saddle during a second, mid-riding position;

Fig. 7 is the identical perspective view of Fig. 6 wherein the rider's pelvis has moved even further rearward along the saddle of the present invention showing the saddle's conforming support of the

rearwardly disposed bones of the rider's pelvis during a third, maximum effort type of riding position;

Fig. 8 is a front perspective view of the saddle of this invention with elevation contours;

Fig. 9 is a side elevation view of the saddle of the present invention showing a cover stretched thereover.

Fig. 10 is a three-quarter front right perspective view of a second embodiment of the saddle of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following detailed description illustrates the invention by way of example, not by way of limitation of the principles of the invention. This description will clearly enable one skilled in the art to make and use the invention, and describes several embodiments, adaptations, variations, alternatives and uses of the present invention.

Figs. 1 to 10 are various views of the specially contoured saddle of this invention employing spaced contour lines (in dimensional measurements) to help illustrate the combination of functional surfaces. Several of the contour lines numerically are position referenced relative to each other; see, for example, number 0.2" to 10.0" in Fig. 1 refers to 0.5 to 25 centimeters; and 1.0" to 3.6" in Fig. 2 refers to 2.5 to 9.0 centimeters, etc. The SCI saddle 1 includes an elongated horn 2 having a pommel 3 at one end and a

pair of concave thigh surfaces 4 forming the transition of the horn 2 to the bilaterally flared rear cantle 5.

The saddle 1 is preferably fabricated from injection-molded polypropylene, polyurethane, ABS copolymer, nylon or other like material in a monocoque construction. The density and molecular weight are selected to be sufficiently high to provide a relatively rigid construction that, while permitting some flexing, should not be so flexible to promote fatigue, inefficiency or inadequate support.

The bilaterally flared rear cantle 5 is further defined by a pair of rearwardly disposed, inclined, scoop or dish-like concave surfaces 6. These surfaces are concave-up and are symmetrical about and spaced laterally from the longitudinal axis A-A of the saddle 1. The upper edge 25 of the dish surfaces is spaced inwardly from the rear and top edge of the cantle 5 to provide a lip or ridge 15, which also functions as a transverse strengthening rib to reinforce the cantle at a principal point of functional stress. An elevated cantle ridge coccyx support surface 32 is located medial and medially behind the raised cantle surfaces 6 of Saddle 1 that rise to bilaterally support the rearwardly disposed, approaching vertical areas of the ischii that are located laterally forward of the impact vertical plane created by the posterior side of the coccyx 18 and sacrum 33 when the seated rider's pelvis 17 is viewed from the side. The elevated cantle ridge coccyx support surface is formed to support the placement of the coccyx 17 between and behind the aforementioned upper edges 25 of the near

vertical, ischial support surfaces of the raised cantle that rise up laterally forward of the plane created by the posterior side of the rider's sacrum 33 and coccyx 18. This enables the steeply rising cantle surface 6 to not intersect the coccyx 18 when bouncing on the saddle while riding and also prevents rearward tilt of the crests of the ilium of the pelvis 17 while riding.

Referring now to Figs. 1-4 and 8, the dished surface concavities, or right and left rear ischii support surfaces, 6 begin aft of a transition zone 7 where the ischial tuberosities of the pelvis will be supported by the shell and then incline rapidly upwardly and rearwardly to perimeter area 8 where the incline has reached an approximately vertical attitude, in comparison to the normal, generally horizontal plane of conventional saddles. This rise in the surface of the concavities to an approximately vertical attitude closely follows the rise to near vertical of the rear right and left ischium of the pelvis.

The right and left rear ischial support surfaces of the concavities 6 rise above the generally horizontal horn surface 2 and simultaneously rise laterally forward of the near vertical plane created by the posterior side of a rider's sacrum 33 and coccyx 18 when the pelvis 17 of the seated rider is viewed from the side (See Figs. 5 to 7). The angle of inclination of the bilaterally separated, raised cantle surfaces 6 of the saddle 1 is sufficient to prevent the rear ischial support surfaces of the concavities 6 from rising up laterally behind the near vertical plane established by the posterior side of the sacrum 33 and

the coccyx 18. The vertical height of the upper edges 25 of the near vertical, right and left rear ischial support surface of the concavities 6 is sufficiently above the generally horizontal upper horn surface to cause the coccyx 18 of the rider to intersect the horizontal plane established by the upper edges 25 when the seated rider's pelvis 17 is viewed from the side. The marginal edge 9 of the concavities 6 flares outwardly from an initial lower point 10 (which also marks the inflection point between the rearward end of the curved thigh surface 4 [Fig. 3] and the outermost (medial) point 11 of the concavities 6). After which the marginal edge 9 curves inward to the uppermost point 25 of the concavities 6. It is at this point that marginal edge 9 merges with the upper-outer edge 28 of a coccyx support 14 whose forward terminal point 12 is shown. The respective forward terminal points 12 of the coccyx support 14 are spaced laterally from the medial axis A-A of the saddle, and an upper coccyx surface 31 of the wedge-like coccyx support 14 commences therebetween.

Also, it should be noted that the upper-outer edges 28 of the coccyx support 14 lie in an elevated position relative to the general location of the concavities 6, thereby forming the raised, flared and wedge-like side surfaces 29 of the coccyx support 14. Combining the upper coccyx support surface 31 with the side surfaces 29, a raised, wedge-like support surface is created in the upper half of the raised cantle 5. Thus, a specific support is created for the coccyx 18 and surrounding tissues and musculature between the buttocks (located directly below and forward of the coccyx 18).

It must also be noted that in the preferred embodiment of this invention, the raised, opposed wedge-like surfaces 29 are transitioned smoothly into the adjacent concavities 6, but, regardless of blending techniques, the main purpose is to differentiate the anatomic support of the coccyx 18 and surrounding tissues and musculature from the support of the rear ischium 22 and its surrounding tissues and musculature. As seen in the lateral view of the pelvis 17 seated upon the SCI saddle in Fig. 7, the close support of the near vertical rise of the rear ischium 22 necessitates the relief and support of the coccyx 18 so that corresponding (near vertical rising) cantle surfaces do not rise directly into and uncomfortably intersect the coccyx 18. Thus, as seen in the preferred embodiment and in Fig. 10, the coccyx support 14 lying medially adjacent to the steeply rising concavities 6 is employed not only to relieve and support the coccyx 18, but also to create a wedge-like projection which uniquely fits and supports the rider's anatomy between the rider's buttocks (located directly below and forward of the coccyx 18), so that a wedge-like barrier to rearward movement of the buttocks on the saddle is created.

The generally triangular (or flared wedge-shaped) coccyx support 14 extends rearwardly from its apex position between the concavities 6 where they transition into the pelvic arch ridge 27. It extends rearwardly and laterally outward (from the central axis) to transition smoothly into the upper edge 25 of the cantle ridge 15 formed between the concavity margins 9 and the rear edge 26 (see Fig. 3). The coccyx support area 14 extends forward and makes a

smooth transition to the raised pelvic arch ridge, zone 27, which in turn extends forwardly to the perineum/genital groove 16. The coccyx support area 14 extends forward and makes a smooth transition to the raised pelvic arch ridge, zone 27, which in turn extends forwardly to the perineum/genital groove 16. The coccyx support area 14 is elevated, as defined by opposed, wedge-like side surfaces 29, and inclined at about 25° or more up from the horizontal upper top surface of the horn, and is preferably slightly dished (concave upwards). It may also be generally flat or the concavity may be lightly padded.

It must be noted that the top surface 31 of the raised coccyx support 14 is blended into the rear cantle ridge 15 adjacent to the upper edges 25 of the concavities 6 in the preferred embodiment. However, as is noted by an alternate embodiment Fig. 10 of the present invention, the rearward perimeter area 8 of the concavities 6 can be extended upwardly to support even more of the near vertical rise of the rear ischium 22 (thus, providing more thrust support), while not raising the coccyx support 14. Thus, the coccyx support 14 would continue to provide anatomic support separate of the rear ischial support surfaces of the concavities 6 in the raised cantle 5. Also in the configuration of Fig. 10, the aft end of the coccyx support 14 may be curved upward so as to match the upward slope of the underside of the coccyx and sacrum.

As best seen in Figs. 2, 3, 4, and 8, the general dimensions and depth of the concavities 6 are represented by the contour lines, wherein each line cor-

responds to the designed vertical elevation gain in centimeters, or in the case of Fig. 1, the axial length (rear to front) along the saddle 1. Generally speaking, the wider spacing between adjacent contour lines denotes the slight or minimal increase in elevation, while the closer spacing of contour lines indicates a more dramatic increase in elevation gain. The base line is taken to be the very bottom point 13 (see Fig. 3) of the saddle 1.

The saddle 1 of the present invention is characterized by an enlarged, bilaterally symmetrical inclined cantle 5 disposed rearwardly of a generally horizontal saddle horn 2 to which the cantle plane is generally inclined at an angle up from the horizontal more than about 35°, while the cantle plane angle may be higher than 55°, for example, 65° or more, one preferred angle may be 45° (see Fig. 3). The saddle 1 is a single bilaterally symmetrical compound surface with the cantle 5 being flared through transitions 7 into the sides of the horn by concave thigh surfaces 4 and into the top of the horn by a pelvic arch ridge 27. Formed into the cantle are a pair of bilaterally symmetrical inclined dished or concave surfaces 6 which rise in inclination from forward bottom horizontal to rearward top approaching vertical. The forward end of the concave surfaces lie about 7.5 centimeters forward of the rearmost end of the saddle (assuming a rear cantle ridge 15 thickness of about 1.2 centimeters) and rises from horizontal base elevation of about 2.5 to about 8.75 centimeters for a total in the range of 5 to 8.75 centimeters, preferably 6.25 centimeters. The inner marginal edges of concavities 6 and side surfaces 29 are spaced from each other along the

bilateral longitudinal axis of symmetry A-A (see Fig. 4), by a generally triangular, elevated inclined coccyx support member 14 which flares wider toward the rear, from about 1.2 centimeters at the forward end to about 7.5 centimeters at the rearmost concavity margin. A perineal/genital relief, or groove, 16 is disposed forward of the pelvic arch ridge 27 in the aftmost 1/3 to 1/2 of the horn. It should be appreciated that the relief may be an opening (not shown) in the saddle 1. As contrasted to conventional saddles with little or no rear-end vertical flare, the SCI saddle of this invention has a pronounced, dished, inclined cantle that rises to about 5 centimeters above the horn surface, and the top of the dish surface is approximately vertical.

In one embodiment mode of the present invention, the concavity 6 begins at a vertical height of approximately 2.5 centimeters above bottom point 13 (see Fig. 2). The depth of the scoop-like concavity 6 is greatest over the vertical height range of 3.5 to 6.5 centimeters and then tapers off at the substantially vertical perimeter area 8 which is at a vertical height of approximately 8.75 centimeters. In other words, the topmost point 24 (see Fig. 3) of the SCI saddle is 3.75 - 6.25 centimeters vertically higher than currently available saddles. There is an increase in the effective height of approximately 6.25 centimeters where the effective height is defined as the distance from the point of contact of the ischial tuberosities, generally at transition point 7, to the marginal edge 9 bounding the rearward perimeter area 8. The additional height permits an increase of up to 50% more surface contact between the concavities of

the SCI saddle and the muscle and tissue portions of the rider's buttocks. The additional surface contact also functions to unweight the anterior portions of the ischial tuberosities and perineum and public arch of the rider so that pressure bearing on the bottom portions of the ischial tuberosities and perineum is more evenly redistributed. A more detailed illustration of this and other features will be discussed upon description of Figs. 5-7 below.

It is understood that the exact dimensions corresponding to the depth, width and height of the dished concavities 6 may vary within the scope of this invention depending on the performance and comfort requirements of different riders and their bicycles. For example, the dimensions of the concavities 6 on a woman's model would be shorter longitudinally and wider laterally to compensate for the generally wider skeletal differences in the female pelvis. Additionally, racing saddles would generally tend to have minimal cantle flare, be streamlined side to side to reduce weight, and be somewhat less flexible, while recreational and "cruiser" type versions would have greater lateral flare (width of the cantle) with less concern to save weight.

Referring back to Figs. 1, 2, 4 and 8, a most important anatomical feature, the coccyx support area 14, is uniquely formed into the flared cantle 5. The coccyx support area 14 is raised having wedge-like side surfaces 29 and lies between the bilateral concavities 6. It is further bounded at the rearward end where the upper coccyx support surface 31 blends into the cantle lip or ridge 15. As noted by the

contour lines and as best seen in Fig. 8, the coccyx support area 14 is generally tongue-like, being flared to a wider top at the higher end where it blends into the cantle ridge 15 (except as noted in alternate embodiments such as Fig. 10), and extends downwardly along the longitudinal axis of the saddle 1 towards the pommel 3. The coccyx support area 14, including inclined rearwardly flaring wedge-like side surfaces 29, continually decreases in altitude, width and flare until it reaches the area adjacent to the inner terminal points 12 of the outer/upper edge 28 of the coccyx support 14, and then is flared smoothly into the raised pelvic ridge 27 where it fades away. The coccyx support area 14 and wedge-like side surfaces 29 are contoured integral with the adjacent concavities 6 to conformingly relieve and support the rider's coccyx and associated bony projections (including the tissue and musculature between the buttocks located directly below and forward of the coccyx) that come into contact with the flared rear cantle 5 of the saddle 1. It should be understood that the entire saddle surface is a compound surface, and that all the defined zones are smoothly flared into each other via intermediate transition zones.

Another anatomic feature of the SCI saddle 1, the perineal/genital groove 16 (herein the "P/G groove") which is disposed along the longitudinal axis A-A of the saddle medial of concavely curved bilateral thigh surfaces 4 and generally in the aft 1/3 to 1/2 of the horn 2. The P/G groove 16 is sized and contoured to provide pressure relief due to the contact of the private parts (perineum and/or genitalia, depending on forward or rearward riding position, respectively) of

both male and female cyclists with the saddle 1. It is worth mentioning that the P/G groove 16 need not be overly deep to provide adequate pressure relief, as is common in other saddle designs, since the better support offered by the rearward concavities 6 and coccyx support area 14 (including the rearwardly flaring, wedge-like side surfaces 29) alleviates a substantial amount of pressure normally caused by conventional saddles on the area of the cyclist's perineum and genital regions.

Figs. 5-7 show three different positions of a cyclist's pelvis and the areas of contact between the pelvis and the SCI saddle of this invention. In Fig. 5, the pelvis 17 is in a forward cycling position where the cyclist is seated over the center of the SCI saddle. In this position a majority of the load on the saddle due to the cyclist's weight is distributed on the transition zone 7 directly beneath ischial tuberosities 20 and the pubic arch 21, resting on the pelvic arch ridge 27 (see Fig. 2), which spans forward from the transition zone 7 to the P/G groove 16, i.e., the region located approximately 8.75 to 18.75 centimeters forward of the upper edge 25 of the concavities 6 as seen on Fig. 5. At the same time pelvic load is supported by coccyx support area 14 beneath the coccyx 18.

In Fig. 6, the cyclist has slid backward along the saddle 1 approximately 2.5 centimeters. The cyclist's weight is now redistributed more evenly among the pubic arch 21, ischial tuberosities 20, rear ischium 22 and coccyx 18. The rear ischium 22, lesser

sciatic notch area 23, and ischial spines 19 are becoming more supported in this position.

Referring now to Fig. 7, the cyclist has assumed a riding position typical for maximum effort and leg extension. The depth of the concavities 6 and wedge-like side surfaces 29, combined with the near vertical surfaces 8 of the concavities 6 provide full, glove-like, support for all the rearwardly disposed bony projections of the pelvis 17, including the ischial spines 19, rear ischium 22, lesser sciatic notch area 23 and the coccyx 18 (including surrounding tissue and musculature). It must be understood that as the rider slides back and forth in the SCI saddle, the shape of the shell compresses the musculature to provide this described support for the bony projections. The SCI saddle of this invention significantly redistributes the loads over substantially the entire surface area of the concavities 6, coccyx support area 14, surface 32, and wedge-like side surfaces 29, thereby minimizing point loads beneath the ischial tuberosities 20 and relieving pressure on the pubic arch 21.

By providing the added rearward support of the steeply rising concavities 6 and coccyx support 14 in the SCI's raised rear cantle 5, over-rotation of the crests of the ilium and the ischial tuberosities 20 is prevented. This support promotes a better riding posture, where the lower vertebrae assume less of an arched or hunched-over position. As a result, since the lower vertebrae are no longer subjected to a constant bending motion, less stress and strain are experienced by the nerves and muscles of the lower back. In addition, by restraining excessive pelvic

float on the saddle with the wedge-like side surfaces 29 and the bilateral concavities 6 in the inclined extended cantle 5 of the invention, less padding is needed for comfort than is required on conventional saddles. A greater amount of surface area of the rider's buttocks and pelvis is supported by the SCI saddle, thus resulting in less instance of bruising, groin pain, numbness, urethritis, saddle sores, and chafing due to pelvic grind.

The unique contour of the coccyx support area 14 provides pressure relief to the coccyx 18 in substantially all possible seated riding positions. The combination of the raised cantle 5 containing the specially contoured concavities 6 with integral, wedge-like coccyx support area 14 also function to provide a surface of resistance for the rider to maximize his thrust on the pedals. That is, cantle 5 and particularly the wedge-like side surfaces 29 and coccyx support area 14 function as a thrust plate by preventing the rider's pelvis (and associated musculature and tissue) from sliding backward any unwanted distance off the back of the saddle.

Another important feature provided in the present invention is the prevention of rearward rotation of the ilial crests of the pelvis when a rider is seated and when pedaling a bicycle. The saddle 1 in accordance with the present invention provides support for the pelvic bone structure which includes three separate and distinct bone projections which protrude downwardly to contact a bicycle saddle. As shown in Figure 5, these bone projections, the right and left ischium 20, and the projection composed of the coccyx

18 and sacrum 33 are hereinafter referred to as the "pelvic tripod".

Heretofore, prior art saddle designs have been directed to specific support of only two of these structures (the bottom of the left ischium and the bottom of the right ischium). Therefore, up to the present, riding on a bicycle seat has been an unbalanced experience in which the third leg of the "pelvic tripod" has been unsupported.

Because prior art saddles do not support the more sensitive and delicate third leg of the pelvic tripod, namely, the coccyx/sacrum, 18, 33, the muscles of the lower back must perform a delicate balancing act to resist rearward rotation of the crests of the ilium of the pelvis, thus resulting in muscle fatigue.

The solution to this aggravating problem is provided by the saddle 1 of the present invention, which includes centrally located structures; namely: (1) the aforementioned coccyx/sacrum support 14 and (2) an elevated, upper cantle ridge sacral-coccyx adaptation, or support surface, 32. The coccyx support 14 rises above the generally horizontal saddle surface to blend into a highly elevated cantle ridge at the proper height to adapt to the related coccal/sacral bone structures.

Concurrently, the center of the highly elevated cantle ridge, located directly rearward of the coccyx support 14, forms a "cantle ridge adaptation" 32 in the center of the said cantle ridge. This adaptation allows the coccyx/sacrum of the rider to pass between

the right and left, steeply inclined ischial support surfaces 8 to prevent the uncomfortable intersection of said ischial support surfaces with the coccyx/ sacrum. So that whether it is concurrent or separate from the coccyx support 14, the center ridge support surface 32 and the structure located in front of it (the coccyx support 14) are able to support and adapt to this most important member of the pelvic tripod. With the present saddle 1, the rider is not required to expend energy in the arm and back muscles to restrain pelvic tilt and movement. Consequently, the rider's pelvis and back are uniquely removed from a state of variable flex, and muscle fatigue is significantly reduced or is not experienced.

In observing the human pelvic anatomy (see Figs. 5-7), the posterior anatomic placement of the coccyx 18 and sacrum 33 rearward of the relatively vertical surfaces of the rear ischium requires that the cantle ridge 15 be adapted around the coccyx and sacrum if these cantle surfaces 8 are to move forward from the area of the back side of the sacrum and coccyx, to directly support the rear ischium. In the present invention, the rear raised cantle does not become a "rear vertebral support structure" (the coccyx and sacrum being the end portions of the vertebral column).

The unique structure of saddle 1 resulted from a recognition that if the approaching vertical sections of the rear ischium are supported by steeply rising cantle surfaces 8, the coccyx 18 and sacrum 33 of the rider (the third leg of the pelvic tripod) must be accommodated. Therefore, with the addition of cen-

trally located accommodating structures (the coccyx support 14 and the elevated cantle ridge adaptation 32), this third tripod member (the coccyx 18/sacrum 33) can be accommodated (unlike previous designs) while the more steeply rising adjacent sections of the rear right and left ischium are concurrently supported without uncomfortable intersection.

To appreciate the structure of the present invention, reference is made to prior art designs such as **Leech** and **Serson** (hereinabove cited) which are not adapted to receive the coccyx of the rider. As shown in Fig. 1 of **Leech** and as described in the text of the patent, the **Leech** saddle contains a "back", which upwardly and rearwardly inclines and from a base portion B with a central "intervening slot or aperture F" located under the area where the coccyx of the pelvis would be seated.

Leech's reference to a seat "back," combined with the figures, clearly shows that the **Leech** design is intended to be of a "vertebral back support variety" (similar to **Serson**, hereinabove cited) and does not support or adapt to the coccyx of the rider.

In both **Serson** and **Young**, hereinabove cited, it is clearly demonstrated that the third leg of the pelvic tripod was not intended to be supported by either a centrally located coccyx support 14 and/or a rear elevated cantle support surface 32 for the sacrum and coccyx.

Turning again to the **Leech** reference, the prior art teaches a hole F where the coccyx of the rider is

located so that **Leech's** cantle is assured of passing behind the sacrum and coccyx. And in examining **Serson's** Fig. 1, it is quite clear that a rider's coccyx could not possibly rest on top of this raised cantle B without extreme damage and pain being inflicted upon the rider. Therefore **Serson** and **Leech** are simply vertebral back support cantle designs.

Instead of only rising behind the coccyx and sacrum as these prior art saddles do, the present saddle 1 uniquely contains rearwardly disposed cantle surfaces 6 which rise to concurrently follow the steep rise of the rear upper ischium which are located laterally forward (when the pelvic tripod is viewed from the side) of the back (posterior) of the sacrum 33 and coccyx 18, so that these said cantle surfaces 8 actually intersect the plane of the surface upon which the coccyx and sacrum ride. These highly elevated cantle surfaces actually go around the coccyx and sacrum (see Fig. 10) when these cantle surfaces are in lateral proximity to the coccyx.

Young, Leech, Brown and **Van Meter**, also hereinabove cited, clearly do not deal with the intersection of the near vertical, elevated ischial support surfaces 8 with the coccyx 18 and sacrum 33. The present saddle 1, on the other hand, is the first to recognize the position of the coccyx relative to the vertical section of the rear ischium 22.

As is best seen in Fig. 9, a stretchable saddle cover 30 may be stretched over and fitted onto the SCI saddle of this invention. Suitable materials for the saddle cover 30 include lycra, vinyl, or other like

elasticized or stretch fabric materials. Alternatively, a relatively thin layer of highly compressible foam padding may be spread over the surface of the SCI shell and a relatively non-stretch cover (leather, vinyl, or other suitable fabric) may be placed over this padding, thus giving the saddle an outward appearance comparable to the outward appearance of the original SCI shell. In other words, the non-stretch cover would more closely follow the contours of the saddle. In addition, a lightly padded material may be used over part or all of the contoured shell of this invention with or without the use of a cover.

The stretchable saddle cover 30 tends to hide the dished surfaces 6 and P/G groove 16 when the rider is not seated on the SCI saddle. However, any of the previous methods of padding or covering the SCI saddle should not impede the function of the saddle to provide full glove-like support of the rider's pelvis and buttocks as they conform to the saddle contours when subjected to the weight of the seated rider.

Likewise, the ischial concavities 6, coccyx support area 14, perineal groove 16, and adjacent wedge-like side surfaces 29 may be filled with a highly compressible foam padding for added comfort to suit the rider's preference. Rails 40 attach to a seat post clamping unit 42 (both shown in phantom) of a seat post 44 in the conventional manner. The saddle rails 40 attach to the SCI saddle by means of plug holes formed into the saddle, much like the way most conventional saddle rails are attached.

It should be understood that various modifications within the scope of this invention can be made by one of ordinary skill in the art without departing from the spirit thereof. For instance, the SCI saddle of this invention may be readily adaptable to recumbent bicycles, tricycles and other forms of human-powered vehicles. I therefore wish my invention to be defined by the scope of the appended claims as broadly as the prior art will permit, and in view of the specification if need be.

WHAT IS CLAIMED IS:

1. A cycle saddle comprising:

a shell having a single, compound upper seating surface, said seating surface including a forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of forwardly facing bilateral concavities matching the rise to near vertical portion of the right and left rear ischium of a rider when seated upon said shell, for providing bilateral anatomic support for the rise to near vertical portion of the right and left ischium, including corresponding musculature and tissue, said concavities rising above the generally horizontal upper horn surface and laterally forward of the back of a rider's sacrum and coccyx but not behind the rider's sacrum when the rider's pelvis is slid into the concavities;

and means for securing said shell to a cycle saddle post.

2. The cycle saddle as in claim 1 further comprising means, defining a forwardly projecting central coccyx support member raised above the generally horizontal upper horn surface, located between said forwardly facing raised bilateral concavities, for supporting the coccyx of the rider and preventing the forward facing concavities from intersecting the coccyx.

3. The cycle saddle as in claim 2 wherein said raised central coccyx support member has a wedge-like shape.

4. The cycle saddle as in claim 3 wherein said cantle thrust plate member is inclined upwardly from said horn member at an angle greater than 35 degrees.

5. Cycle saddle as in claim 4 wherein said horn upper seating surface includes means, defining a perineum/genital relief, for relieving contact pressure between the perineum region and genitals of the rider and said horn upper seating said perineum/genital groove being bilaterally symmetrical along a longitudinal axis of the shell.

6. A cycle saddle comprising:

a shell having a single, compound upper seating surface, said seating surface including a forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of forwardly facing bilateral concavities matching the rise to near vertical portion of the right and left rear ischium of a rider when seated upon said shell, for providing bilateral anatomic support for the rise to near vertical portion of the right and left ischium including corresponding musculature and tissue, said concavities rising above the generally horizontal upper horn surface;

means defining a forwardly projecting central coccyx support member raised above the generally horizontal upper horn surface, located between

said forwardly facing raised bilateral concavities, for supporting the coccyx of the rider and preventing the forward facing concavities from intersecting the coccyx, said central coccyx support member comprises a substantially flat plane having an inclination greater than about 25 degrees relative to said upper horn surface.

7. A cycle saddle as in claim 6 wherein said upper surface of said coccyx support member is slightly concave in a downward direction.

8. A cycle saddle as in claim 7 wherein said cantle member includes means, defining a rearwardly disposed continuous cantle ridge immediately aft of said concave surfaces and a rearward end of said coccyx support area, for providing transverse support to said cantle, the latter being subjected to repeated cycles of great force due to rearward pelvic thrust.

9. A cycle saddle as in claim 8 wherein said cantle member has an angle of inclination of about 45 degrees, and said cantle ridge has a topmost point in the range from about 2.5 centimeters to about 7.5 centimers above said horizontal upper surface of said horn.

10. A cycle saddle as in claim 9 wherein a forward end of said concavities' surfaces are located about 8.75 centimeters to about 10 centimeters from a rearward-most point of said shell's uppermost rearward margins, said concavities are disposed adjacent to said cantle ridge spaced about 1.25 centimeters from the rearward-most point of said saddle; and said

concavities have surfaces with a total dish height ranging from about 2.5 centimeters to about 8.75 centimeters, wherein said dish height is the vertical distance from a forward end to said uppermost rearward margins of said concave surface.

11. A cycle saddle as in claim 10 wherein said shell is fabricated from a material having means, defining the density and thickness thereof, for providing a preselected amount of flexure.

12. A cycle saddle as in claim 11 wherein said shell is fabricated from an injection-molded plastic in a monocoque construction.

13. A cycle saddle as in claim 12 further comprising a saddle cover adapted to fit over said cycle saddle and padding means for providing additional comfort and protection in order to accommodate riders having varying pelvic structures, riding styles, and riding positional preferences.

14. A cycle saddle as in claim 13 wherein said cover comprises a stretchable cloth material.

15. A cycle saddle as in claim 14 wherein said cover comprises lycra.

16. A cycle saddle as in claim 14 wherein said cover comprises vinyl.

17. A cycle saddle comprising:

a shell having a single, compound upper seating surface, said seating surface including a

forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of forwardly facing bilateral concavities matching the rise to near vertical portion of the right and left ischium of a rider when seated upon said shell, for providing bilateral anatomic support of the rise to near vertical portion of the right and left ischium including corresponding musculature and tissue without supporting the rider's coccyx; and

means for securing said shell to a cycle saddle post.

18. The cycle saddle as in claim 17 further comprising means, defining a raised forwardly projecting central coccyx support member between said bilateral concavities, for supporting the coccyx of the rider and preventing the forward facing concavities from intersecting the coccyx, said central coccyx support member comprising a surface contoured to accept the coccyx and sacrum of a rider and having an angle of inclination, relative to said upper horn surface, greater than about 25 degrees.

19. A cycle saddle comprising:

a shell having a single, compound upper seating surface, said seating surface including a forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of forwardly facing bilateral concavities commencing in the horn member of the saddle and

elevating and inclining above the generally horizontal upper surfaces of the horn member to end in a highly elevated, forward facing attitude, for supporting a rider's sacrum, coccyx and ischium when the rider's pelvis is slid into the concavities.

20. The cycle saddle as in claim 19 further comprising means, defining a raised forwardly projecting central coccyx support member between said bilateral concavities, for supporting the coccyx of the rider while preventing the forward facing concavities from intersecting the coccyx.

21. The cycle saddle as in claim 19 wherein the forwardly facing bilateral concavities are disposed for straddling the coccyx without intersection thereof.

22. A cycle saddle comprising:

A shell having a single, compound upper seating surface, said seating surface including a forwardly disposed horn member having a generally horizontal upper surface and a rearwardly disposed, highly elevated, and laterally flaring cantle thrust plate member, the cantle thrust plate member including means, defining a pair of forwardly facing, bilaterally separated concavities matching and supporting the rise to near vertical portions of the right and left rear ischii including corresponding musculature and tissues of a rider when seated upon said shell, said right and left rear ischial support surfaces of said concavities rising above the generally horizontal horn surface and at the same time rising up laterally forward of a near vertical plane established by a

posterior side of a rider's sacrum and coccyx when the pelvis of the seated rider is viewed from the side, the angle of inclination of the bilaterally separated concavities being sufficient to prevent the concavities from rising past and laterally behind the near vertical plane established by the sacrum and coccyx, upper edges of the concavities being dispersed above the generally horizontal upper horn surface in order to cause the coccyx of the rider to intersect a horizontal plane established when the rider is seated on the shell, and

means for securing said shell to a cycle saddle post.

23. The cycle saddle as in claim 22 further comprising means, defining a forwardly and upwardly projecting central coccyx support member raised above and behind the generally horizontal upper horn surface and located between said forwardly facing raised bilateral concavities, for supporting the coccyx of the rider and for preventing highly raised cantle surfaces, whose angle of inclination when following the rise to near vertical of the right and left rear ischii causes these cantle surfaces to rise up laterally forward of the approaching vertical plane created by the posterior side of the coccyx and sacrum when the seated rider's pelvis is viewed from the side, from intersecting the coccyx and sacrum, thereby allowing the rider's coccyx to comfortably reside within a raised cantle structure with the rearwardly disposed cantle concavity surfaces inclined to bilaterally support the rise to near vertical of the right and left rear ischii located laterally forward of a near vertical plane established by the posterior side

of the coccyx and sacrum, said coccyx support also preventing rearward rotation of the crests of the rider's ilium as well as preventing rearward and lateral movement of the pelvis thereby preventing muscle fatigue.

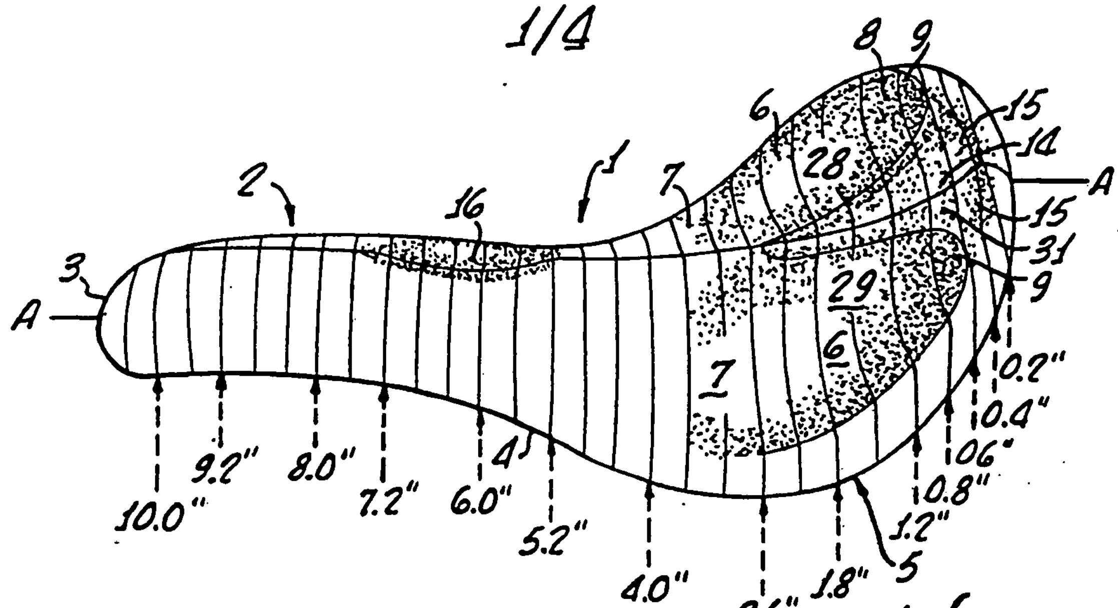


FIG. 1.

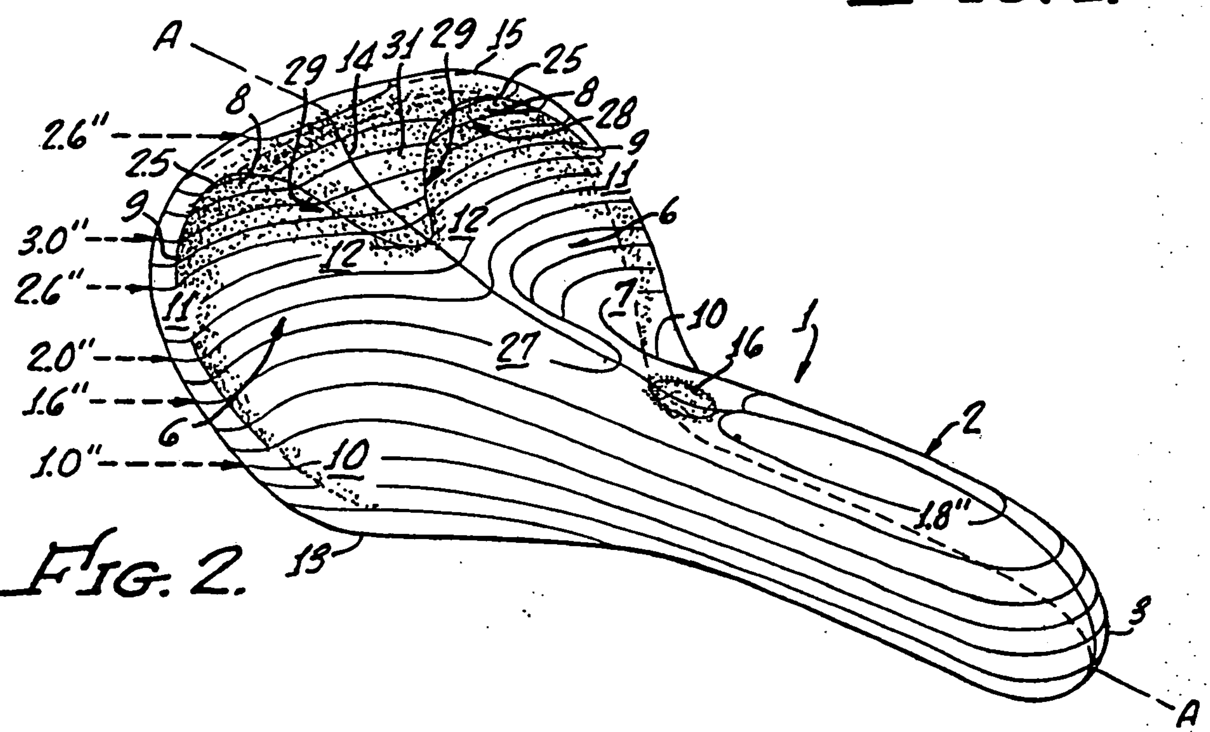


FIG. 2.

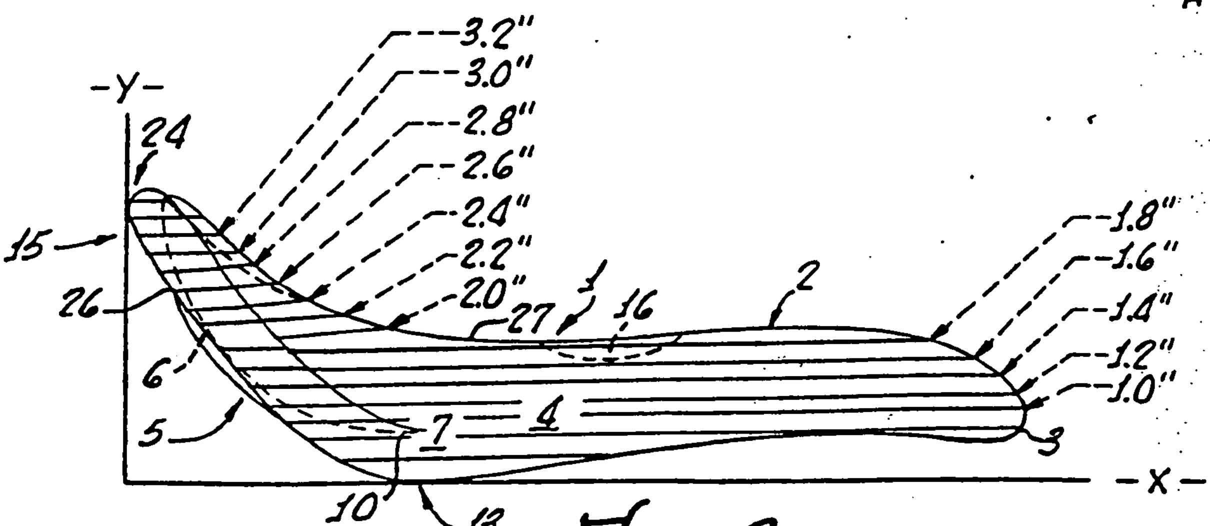
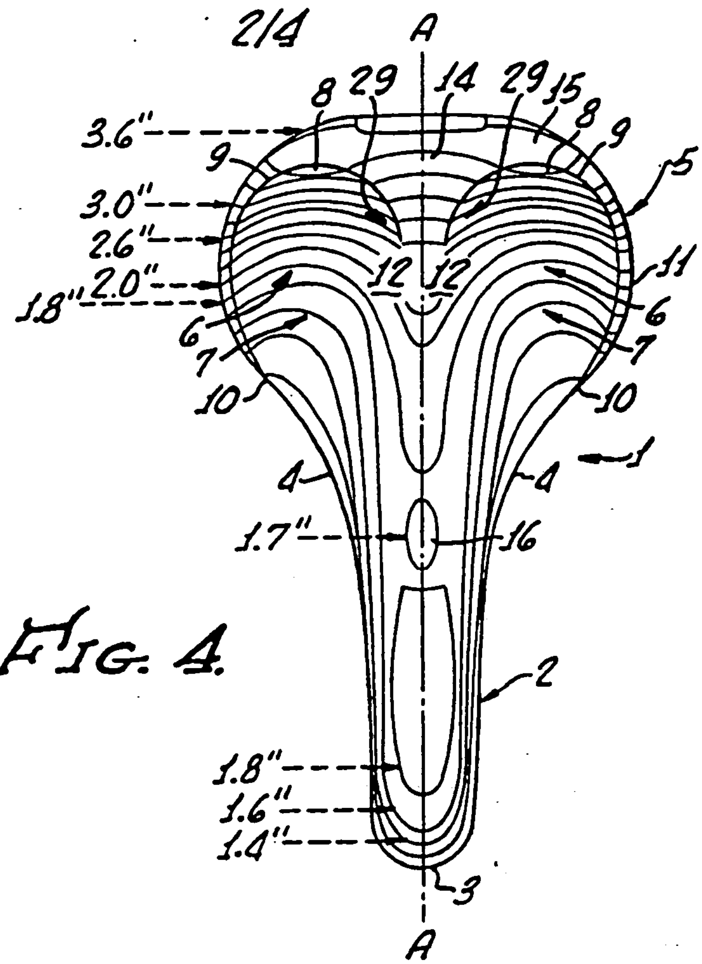


FIG. 3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9
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3.0"
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2.0"
1.8"
12
12
11
6
6
7
7
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10
4
4
1
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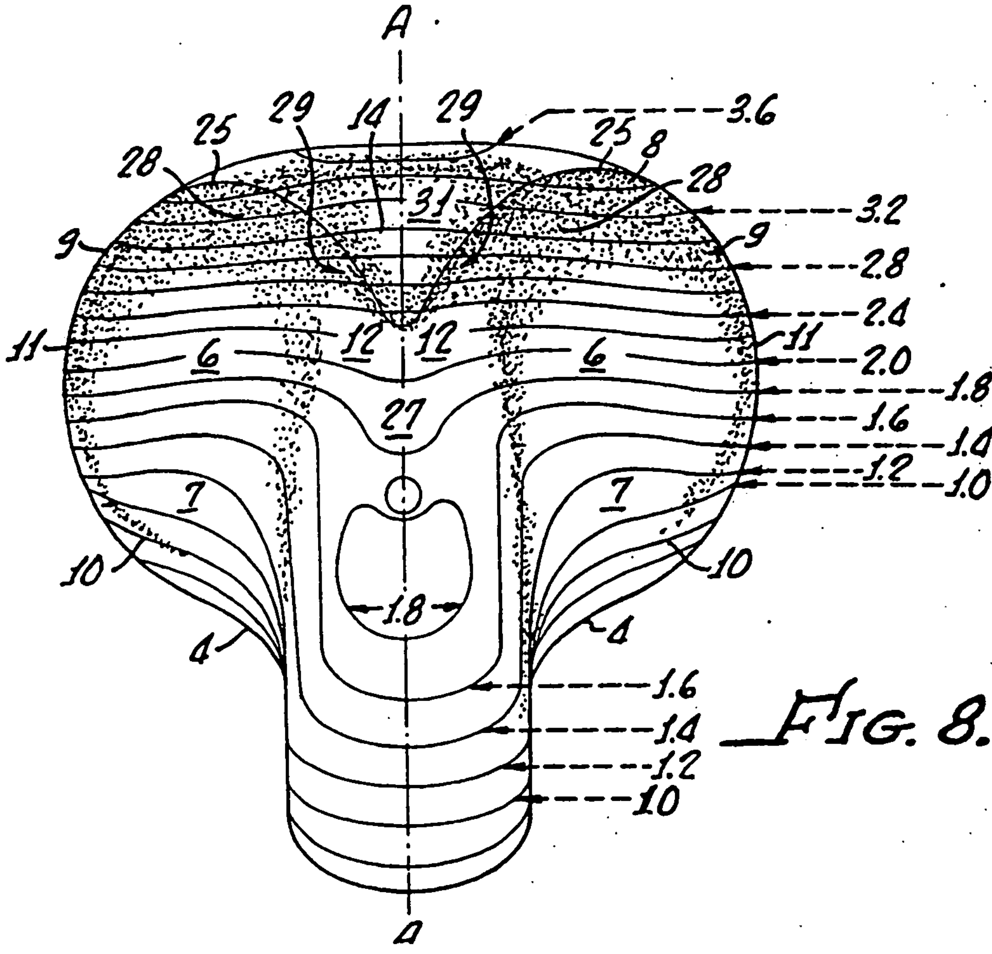
16
2
1.8"
1.6"
1.4"
3
A

FIG. 4.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27
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FIG. 8.

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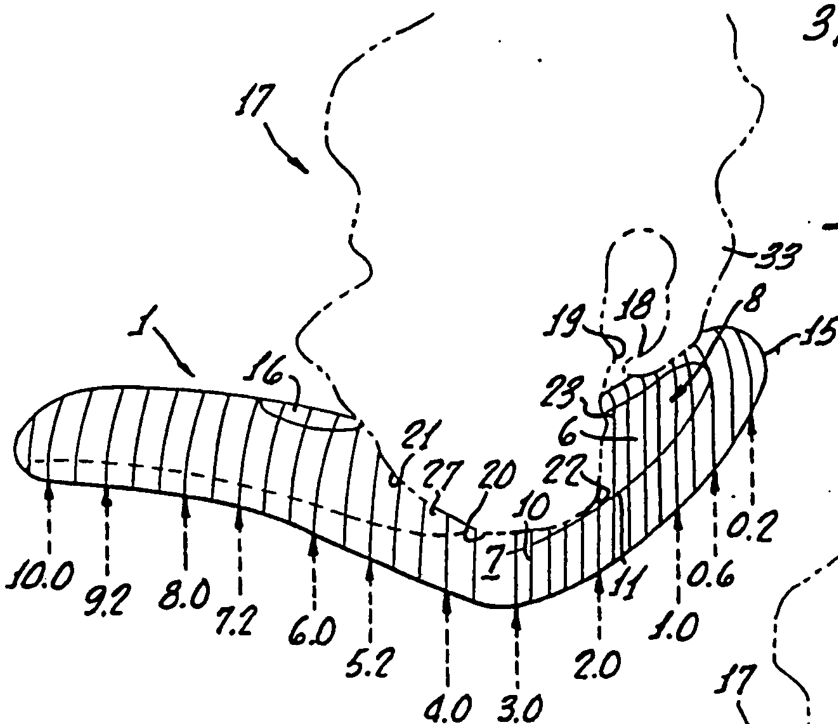

FIG. 5.

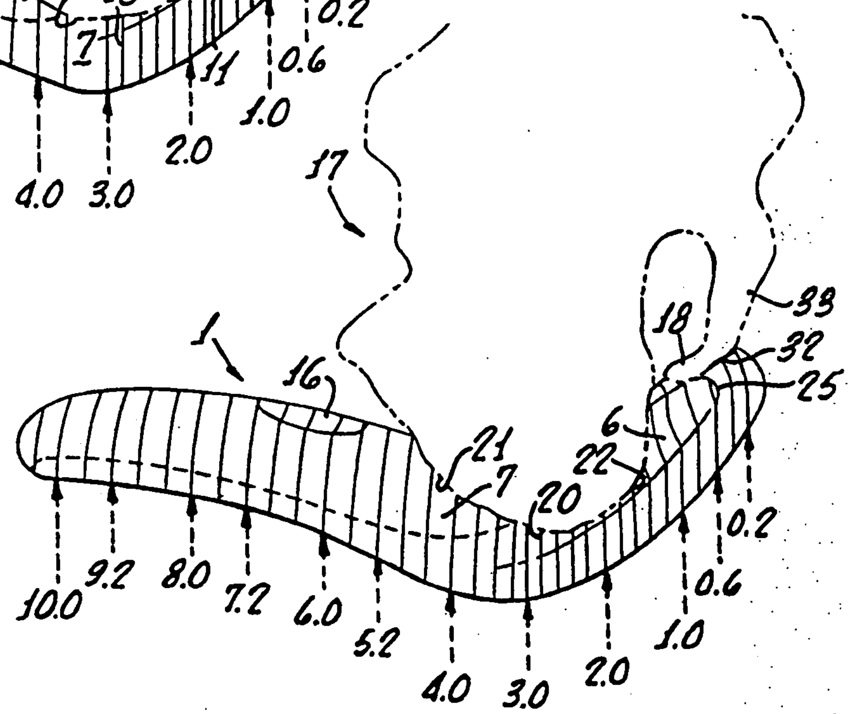

FIG. 6.

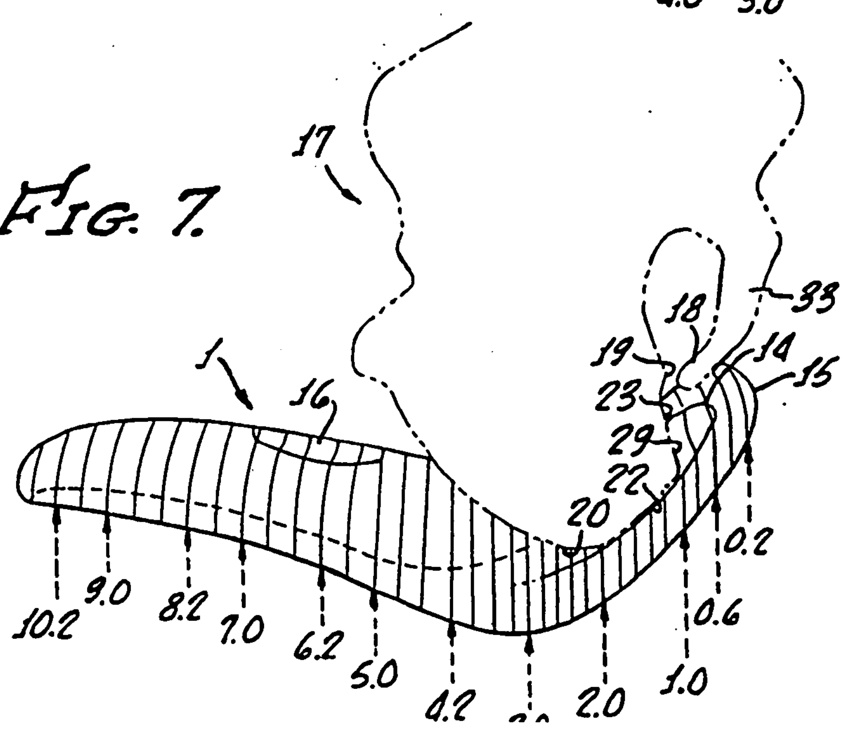

FIG. 7.

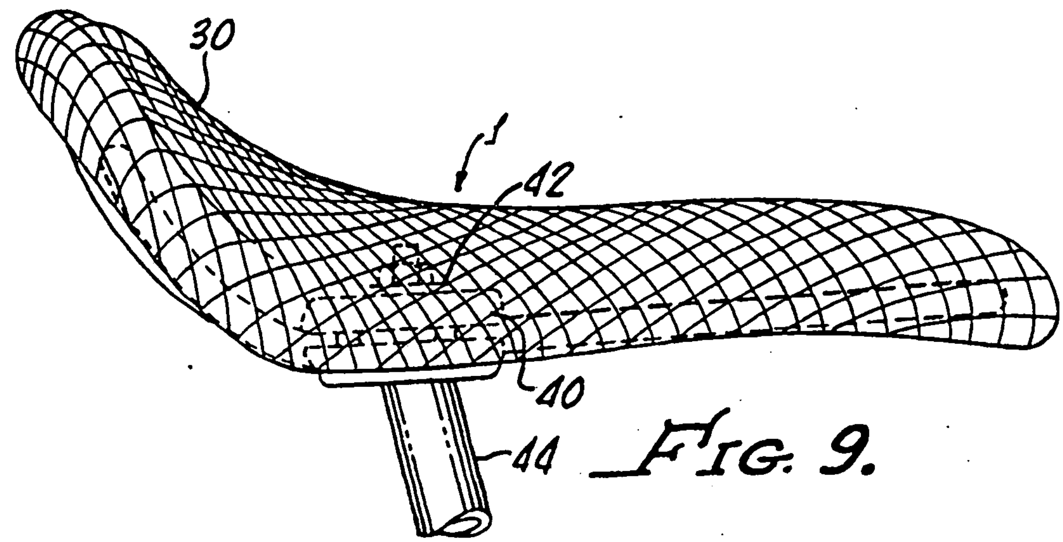

FIG. 9.

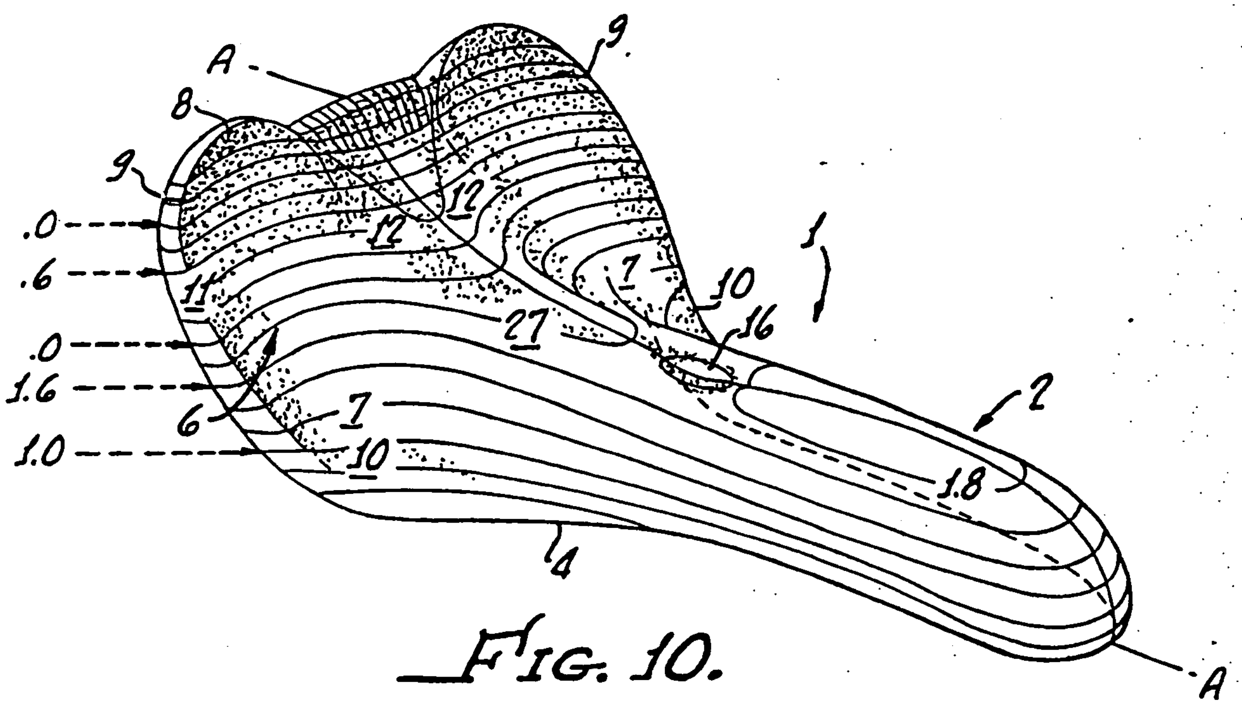

FIG. 10.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US90/03893

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5) : B62J 1/00
U.S. Cl : 297/195,214

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
U.S.	297/195,201,214,458,459

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No [13]
X Y	EP, 286,559 (BEYLET) 12 October 1988 See Figures 1-6.	1-4,6,17-23 5
Y	US,A 25,030 (YOUNG) 31 December 1895 See Figure 1.	5
A	US,A 29,719 (LEECH) 22 November 1898 See Figure 1.	1
A	US,A 574,503 (VAN METER) 05 January 1897 See Figures 1-3.	1

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

03 OCTOBER 1990

Date of Mailing of this International Search Report

07 JAN 1991

International Searching Authority

ISA/US

Signature of Authorized Officer

PETER R. BROWN